

## Patent claims

1. A flame-retardant mixture for lignocellulose composites,

5 **characterized by**

- from 60 to 90% by mass of particulate and/or fibrous lignocellulose materials and

10 - from 40 to 10% by mass of a flame-retardant concentrate immobilized on and/or in the particulate and/or fibrous lignocellulose materials as carriers, with

15 from 16 to 60% by mass of flame retardants of the type consisting of boric acids and/or the salts thereof and

from 16 to 75% by mass of melamine resins,

$h = 5$

20 the flame retardant of the type consisting of boric acids and/or the salts thereof being present chemically coupled to the melamine resins, and the flame retardant concentrates being present immobilized on and/or in the carrier substance of the particulate and/or fibrous lignocellulose materials as carriers.

25 2. The flame-retardant mixture as claimed in claim 1, **characterized in that** the flame retardant concentrate immobilized on and/or in the particulate and/or fibrous lignocellulose materials as carriers furthermore comprises up to 50% by mass of synergistic agents and/or 25% by mass of further additives.

30 3. The flame-retardant mixture as claimed in claim 1 or 2, **characterized in that** the particulate and/or fibrous lignocellulose materials

are chips, fibers and/or granular particles of softwoods and/or hardwoods, regenerated cellulose fibers, paper fibers, cotton fibers and/or bast fibers of flax, hemp, jute, ramie, sisal or kenaf.

- 5     4.     The flame-retardant mixture as claimed in at least one of claims 1 to 3,  
         **characterized in that** the melamine resins are polycondensates partly or  
         completely etherified with C<sub>1</sub>-C<sub>18</sub>-monoalcohols, dialcohols and/or  
         polyalcohols and comprising melamine and C<sub>1</sub>-C<sub>8</sub>-aldehydes, preferably  
         comprising melamine and formaldehyde.
- 10     5.     The flame-retardant mixture as claimed in at least one of the preceding  
         claims, **characterized in that** the melamine resins are relatively high  
         molecular weight melamine resin ethers having number average molar  
         masses of from 500 to 50 000.
- 15     6.     The flame-retardant mixture as claimed in at least one of the preceding  
         claims, **characterized in that** the flame retardants of the type consisting of  
         boric acids and/or the salts thereof are boric acid, metaboric acid, sodium  
         tetraborate, sodium octaborate and/or ammonium pentaborate, the molar  
20     B<sub>2</sub>O<sub>3</sub>:Na<sub>2</sub>O ratio being from 1:0 to 2:1.
7.     The flame-retardant mixture as claimed in at least one of the preceding  
         claims, **characterized in that** the synergistic agents are urea, melamine,  
         melamine cyanurate, unetherified melamine resin precondensates, partly  
25     etherified melamine resin precondensates, cyanuric acid and/or  
         phosphorus salts of the type consisting of sodium phosphates,  
         monoammonium phosphates and/or ammonium polyphosphates, the  
         proportion of the phosphorus salts being from 0 to 60% by mass, based on  
         the overall sum of the synergistic agents.
- 30     8.     The flame-retardant mixture as claimed in at least one of the preceding  
         claims, **characterized in that** the further additives

are water repellants, impregnating auxiliaries and/or immobilizing auxiliaries for flame retardants.

9. A process for the production of a flame-retardant lignocellulose composite comprising a flame-retardant mixture as claimed in at least one of claims 1 to 8,

**characterized in that**

- the composite is produced by a liquid impregnation process in which the particulate and/or fibrous lignocellulose materials are impregnated with solutions or dispersions of flame retardants of the type consisting of boric acids and/or the salts thereof at temperatures of from 20 to 90°C by spraying or immersion, and the particulate and/or fibrous lignocellulose materials impregnated with flame retardant concentrates are dried at from 55 to 170°C with partial curing of the melamine resins.

10. The process as claimed in claim 9, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions of melamine resins in water, C<sub>1</sub>-C<sub>8</sub>-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of from C<sub>1</sub>-C<sub>8</sub>-alcohols, having a solids content of melamine resins of from 10 to 60% by mass, which solutions contain the flame retardants of the type consisting of boric acids and/or the salts thereof and optionally synergistic agents in dissolved or dispersed form.

11. The process as claimed in claim 9, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions or dispersions of the synergistic agents and subsequently with solutions of melamine resins in water, C<sub>1</sub>-C<sub>8</sub>-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C<sub>1</sub>-C<sub>8</sub>-alcohols, having a

solids content of melamine resins of from 10 to 60% by mass, which solutions contain the flame retardants of the type consisting of boric acids and/or the salts thereof in dissolved or dispersed form.

- 5 12. The process as claimed in claim 9, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions or dispersions of the flame retardants and of the synergistic agents and subsequently with solutions of melamine resins in water, C<sub>1</sub>-C<sub>8</sub>-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C<sub>1</sub>-C<sub>8</sub>-alcohols, having a  
10 solids content of melamine resins of from 10 to 60% by mass.
13. The process as claimed in claim 9, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions or dispersions of the flame retardants and of the synergistic agents and subsequently with  
15 solutions of melamine resins in water, C<sub>1</sub>-C<sub>8</sub>-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C<sub>1</sub>-C<sub>8</sub>-alcohols having a solids content of melamine resins of from 10 to 60% by mass.
14. The process as claimed in claim 9, **characterized in that** the particulate  
20 and/or fibrous lignocellulose materials are impregnated with solutions of melamine resins in water, C<sub>1</sub>-C<sub>8</sub>-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C<sub>1</sub>-C<sub>8</sub>-alcohols, having a solids content of melamine resins of from 10 to 60% by mass, and subsequently with solutions of the flame retardants of the type consisting of  
25 boric acids and/or the salts thereof.
15. The process as claimed in claim 9, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions of the flame retardants of the type consisting of boric acids and/or the salts thereof,  
30 subsequently with solutions or dispersions of the synergistic agents and

subsequently with solutions of melamine resins in water, C<sub>1</sub>-C<sub>8</sub>-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C<sub>1</sub>-C<sub>8</sub>-alcohols, having a solids content of melamine resins of from 10 to 60% by mass.

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16. The process as claimed in at least one of claims 9 to 15, **characterized in that** the further additives are added to the melamine resins, to the flame retardants of the type consisting of boric acids and/or the salts thereof and/or to the synergistic agents.

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17. The process for the production of a flame-retardant lignocellulose composite comprising a flame-retardant mixture as claimed in at least one of claims 1 to 8,

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**characterized in that**

the flame-retardant mixture is prepared by a melt impregnation process in which flame retardants are dispersed and partly dissolved in melts of melamine resins at from 35 to 130°C and subsequently the particulate and/or fibrous lignocellulose materials are dispersed in the mixtures and impregnated with the melt of said mixtures,

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partial curing of the melamine resin taking place as a result of a temperature increase to 90 to 170°C and further additives being added to the melamine resins, to the flame retardants of the type consisting of boric acids and/or the salts thereof and/or to the synergistic agents.

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18. The process as claimed in claim 17, **characterized in that**, in the melt impregnation process, in addition to the flame retardants of the type consisting of boric acids and/or the salts thereof and also synergistic

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agents are dispersed and partly dissolved in the melts of melamine resins at from 35 to 130°C.

19. A process using a flame-retardant mixture as claimed in at least one of claims 1 to 8,

**characterized in that**

the composite is produced by a liquid impregnation/solids mixing process in which the particulate and/or fibrous lignocellulose materials are impregnated with solutions or dispersions of flame retardants of the type consisting of boric acids and/or the salts thereof at temperatures of from 20 to 90°C by spraying or immersion, and the impregnated particulate and/or fibrous lignocellulose materials are dried.

20. The process as claimed in claim 19, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions of melamine resins in water, C<sub>1</sub>-C<sub>8</sub>-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C<sub>1</sub>-C<sub>8</sub>-alcohols, having a solids content of melamine resins of from 10 to 60% by mass, and simultaneously or subsequently with solutions of the flame retardants of the type consisting of boric acids and/or the salts thereof at temperatures of from 20 to 90°C, the impregnated particulate and/or fibrous lignocellulose materials are dried at from 55 to 170°C with partial curing of the melamine resins, and synergistic agents are mixed as solids with the impregnated particulate and/or fibrous lignocellulose materials.
21. The process as claimed in claim 19, **characterized in that** the particulate and/or fibrous lignocellulose materials

are impregnated with solutions of the flame retardants of the type consisting of boric acids and/or the salts thereof at temperatures of from 20 to 90°C, the impregnated particulate and/or fibrous lignocellulose materials are dried at from 55 to 170°C, and synergistic agents and melamine resins are mixed as solids with the impregnated particulate and/or fibrous lignocellulose materials.

22. The process as claimed in claim 19, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions and/or dispersions of the flame retardants of the type consisting of boric acids and/or the salts thereof and synergistic agents at temperatures of from 20 to 90°C, the impregnated particulate and/or fibrous lignocellulose materials are dried at from 55 to 170°C, and melamine resins are mixed as solids with the impregnated particulate and/or fibrous lignocellulose materials.

23. The process as claimed in at least one of claims 19 to 22, **characterized in that** the further additives are added to the melamine resins, to the flame retardants of the type consisting of boric acids and/or the salts thereof and/or to the synergistic agents.

24. A molding material for the production of flameproofed lignocellulose composites,

**prepared by**

dry premixing of the components

- from 40 to 95% by mass of flame-retardant mixture as claimed in at least one of claims 1 to 8,

- from 5 to 60% by mass of thermosetting prepolymers of the type consisting of phenol resins, urea resins, melamine resins, guanidine resins, cyanamide resins and/or aniline resins and
- from 0.1 to 10% by mass of processing auxiliaries and/or auxiliaries,

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and granulation.

25. The molding material as claimed in claim 24, **characterized in that** the preparation is effected by melt compounding at from 100 to 170°C and granulation following the dry premixing of the components.

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26. A flameproofed lignocellulose composite, **produced by** extrusion, injection molding or pressing of the molding materials as claimed in claim 24 or 25 and curing.

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27. The use of the lignocellulose composites as claimed in claim 26 as flame-retardant semifinished products and molding materials for applications in outdoor use in the building and leisure sector.